

## Claims

We claim:

- 1    1. A three-dimensional television system, comprising:
  - 2        an acquisition stage, comprising:
    - 3            a plurality of video cameras, each video camera configured to
    - 4            acquire a video of a dynamically changing scene in real-time;
    - 5            means for synchronizing the plurality of video cameras; and
    - 6            a plurality of producer modules connected to the plurality of video
    - 7            cameras, the producers modules configured to compress the videos to
    - 8            compressed videos and to determine viewing parameters of the
    - 9            plurality of video cameras;
  - 10      a display stage, comprising:
    - 11            a plurality of decoder modules configured to decompress the
    - 12            compressed videos to uncompressed videos;
    - 13            a plurality of consumer modules configured to generate a plurality of
    - 14            output videos from the decompressed videos;
    - 15            a controller configured to broadcast the viewing parameters to the
    - 16            plurality of decoder modules and the plurality of consumer modules;
    - 17            a three-dimensional display unit configured to concurrently display
    - 18            the output videos according to the viewing parameters; and
    - 19            means of connecting the plurality of decoder modules, the plurality of
    - 20            consumer modules, and the plurality of display units; and
  - 21      a transmission stage, connecting the acquisition stage to the display stage,
  - 22      configured to transport the plurality of compressed videos and the viewing
  - 23      parameters.

- 1    2. The system of claim 1, further comprising a plurality of cameras to acquire
- 2    calibration images displayed on the three-dimensional display unit to determine the
- 3    viewing parameters.
  
- 1    3. The system of claim 1, in which the display units are projectors.
  
- 1    4. The system of claim 1, in which the display units are organic light emitting
- 2    diodes.
  
- 1    5. The system of claim 1, in which the three-dimensional display unit uses front-
- 2    projection.
  
- 1    6. The system of claim 1, in which the three-dimensional display unit uses rear-
- 2    projection.
  
- 1    7. The system of claim 1, in which the display unit uses two-dimensional display
- 2    element.
  
- 1    8. The system of claim 1, in which the display unit is flexible, and further
- 2    comprising passive display elements.
  
- 1    9. The system of claim 1, in which the display unit is flexible, and further
- 2    comprising active display elements.
  
- 1    10. The system of claim 1, in which different output images are displayed
- 2    depending on a viewing direction of a viewer.

- 1    11. The system of claim 1, in which static view-dependent images of an  
2    environment are displayed such that a display surface disappears.
- 1    12. The system of claim 1, in which dynamic view-dependent images of an  
2    environment are displayed such that a display surface disappears.
- 1    13. The system of claim 11 or 12, in which the view-dependent images of the  
2    environment are acquired by a plurality of cameras.
- 1    14. The system of claim 1, in which each producer module is connected to a subset  
2    of the plurality of video cameras.
- 1    15. The system of claim 1, in which the plurality of video cameras are in a  
2    regularly spaced linear and horizontal array.
- 1    16. The system of claim 1, in which the plurality of video cameras are arranged  
2    arbitrarily.
- 1    17. The system of claim 1, in which an optical axis of each video camera is  
2    perpendicular to a common plane, and the up vectors of the plurality of video  
3    cameras are vertically aligned.
- 1    18. The system of claim 1, in which the viewing parameters include intrinsic and  
2    extrinsic parameters of the video cameras.

1        19. The system of claim 1, further comprising:  
2            means for selecting a subset of the plurality of cameras for acquiring a  
3            subset of videos.

1        20. The system of claim 1, in which each video is compressed individually and  
2            temporally.

1        21. The system of claim 1, in which the viewing parameters include a position,  
2            orientation, field-of-view, and focal plane, of each video camera.

1        22. The system of claim 1, in which the controller determines, for each output pixel  
2             $o(x, y)$  in the output video, a view number  $v$  and a position of each source pixel  $s(v,$   
3             $x, y)$  in the decompressed videos that contributes to the output pixel in the output  
4            video.

1        23. The system of claim 22, in which the output pixel is a linear combination of  $k$   
2            source pixels according to

3            
$$o(u, v) = \sum_{i=0}^k w_i s(v, x, y),$$

4            where blending weights  $w_i$  are predetermined by the controller based on the  
5            viewing parameters.

1        24. The system of claim 22, in which a block of the source pixels contribute to  
2            each output pixel.

1    25. The system of claim 1, in which the three-dimensional display unit includes a  
2    display-side lenticular sheet, a viewer-side lenticular sheet, a diffuser, and substrate  
3    between each lenticular sheets and the diffuser.

1    26. The system of claim 1, in which the three-dimensional display unit includes a  
2    display-side lenticular sheet, a reflector, and a substrate between the lenticular  
3    sheets and the reflector.

1    27. The system of claim 1, in which an arrangement of the cameras and an  
2    arrangement of the display units, with respect to the display unit, are substantially  
3    identical.

1    28. The system of claim 1, in which the plurality of cameras acquire high-dynamic  
2    range videos.

1    29. The system of claim 1, in which the display units display high-dynamic range  
2    images of the output videos.

1    30. A three-dimensional television system, comprising:  
2         an acquisition stage, comprising:  
3             a plurality of video cameras, each video camera configured to acquire  
4             an input video of a dynamically changing scene in real-time;  
5         a display stage, comprising:  
6             a three-dimensional display unit configured to concurrently display  
7             output videos generated from the input videos; and  
8         a transmission network connecting the acquisition stage to the display stage.

- 1    31. A method for providing three-dimensional television, comprising:
- 2        acquiring a plurality of synchronized videos of a dynamically changing
- 3        scene in real-time;
- 4        determining viewing parameters of the plurality of videos;
- 5        generating a plurality of output videos from the plurality of synchronized
- 6        input videos according to the viewing parameters; and
- 7        displaying concurrently the plurality of output videos on a three-dimensional
- 8        display unit.